Claims

1. A one pot method for large scale production of an organometallic compound comprising (i) reacting a hydrocarbon or heteroatom-containing material with a base material in the presence of a solvent and under reaction conditions sufficient to produce a first reaction mixture comprising a hydrocarbon or heteroatom-containing compound, (ii) adding a metal source compound to said first reaction mixture, (iii) reacting said hydrocarbon or heteroatom-containing compound with said metal source compound under reaction conditions sufficient to produce a second reaction mixture comprising said organometallic compound, and (iv) separating said organometallic compound from said second reaction mixture.

2. The one pot method of claim 1 wherein the large scale production amounts to about 0.25 kilograms or greater of said organometallic compound.

3. The one pot method of claim 1 wherein the large scale production amounts to about 0.5 kilograms or greater of said organometallic compound.

4. The one pot method of claim 1 wherein the large scale production amounts to about 1.0 kilograms or greater of said organometallic compound.

5. The one pot method of claim 1 wherein the organometallic compound yield is from about 75 to 99% or greater.

6. The one pot method of claim 1 wherein the organometallic compound yield is from about 80 to 99% or greater.

7. The one pot method of claim 1 wherein the hydrocarbon or heteroatom-containing material comprises an amine, alcohol, diketone, cyclopentadiene, imine, hydrocarbon or halogen.

8. The one pot method of claim 1 wherein the base material has a pKa greater than about 10.

9. The one pot method of claim 1 wherein the base material comprises BuLi, MeLi, NaH, CaH or a lithium amide.

10. The one pot method of claim 1 wherein the hydrocarbon or heteroatom-containing compound comprises a lithiated amide, alkoxide, diketonate, cyclopentadienide or imide.

11. The one pot method of claim 1 wherein the metal source compound is represented by the formula MX_n wherein M is a transition metal, X is halide and n is a value of 3, 4 or 5.

12. The one pot method of claim 11 wherein the transition metal is selected from hafnium, titanium, zirconium, tantalum and molybdenum.

13. The one pot method of claim 1 wherein the metal source compound comprises $HfCl_4$, HfF_4, $HfBr_4$, HfI_4 or $Hf(OTf)_4$.

14. The one pot method of claim 1 wherein the metal source compound is $HfCl_4$.

15. The one pot method of claim 1 wherein the metal source compound is added to the first reaction mixture at ambient temperature or at a temperature greater than ambient temperature.

16. The one pot method of claim 1 wherein the solvent is selected from saturated and unsaturated hydrocarbons, aromatic hydrocarbons, aromatic heterocycles, alkyl halides, silylated hydrocarbons, ethers, polyethers, thioethers, esters, thioesters, lactones, amides, amines, polyamines, nitriles, silicone oils, other aprotic solvents, or mixtures of one or more of the above.

17. The one pot method of claim 1 wherein the solvent is selected from hexanes, THF or mixtures thereof.

18. The one pot method of claim 1 wherein the organometallic compound comprises a transition metal-containing amide, alkoxide, diketonate, cyclopentadienide or imide.

19. The one pot method of claim 1 wherein the organometallic compound comprises hafnium amide,

hafnium (IV) tert-butoxide, hafnium (IV) acetylacetonate, bis(cyclopentadienyl)hafnium dichloride or t-butylimidobis(dimethylamino)hafnium.

20. A one pot method for producing a liquid hafnium amide compound comprising (i) reacting an amine with a lithiated base material to produce a first reaction mixture comprising a lithium amide, (ii) adding a hafnium halide to said first reaction mixture, (iii) reacting said lithium amide with said hafnium halide under reaction conditions sufficient to produce a second reaction mixture comprising said liquid hafnium amide compound, and (iv) separating said liquid hafnium amide compound from said second reaction mixture.